

WHAT IS CLAIMED IS:

1. A process for upgrading non-virgin plastic material to be reclaimed comprising the steps of

continuously extruding said plastic material to provide elongated strands thereof;

continuously cutting said elongated strands as they are supplied by said extrusion step to convert them into pellets;

immediately feeding said pellets without intermediate storage;

continuously crystallizing said pellets, as they are fed in said feeding step from said cutting step, in a stream of hot gas of a desired temperature to heat the pellets to crystallizing temperature; and

solid state condensing said pellets under heat in a continuous flow after said crystallization step to reach a desired intrinsic viscosity.

2. The process as claimed in Claim 1, wherein said crystallizing step is carried out in a continuous fluidized bed of predetermined characteristic of flow of said pellets, said predetermined characteristic being preferably a plunger characteristic.

3. The process as claimed in Claim 1, wherein at least one of the following characteristics is provided:

- a) said crystallizing step is a one-step process;
- b) the step of solid state condensing said pellets is effected without substantial change in intrinsic viscosity of said pellets in comparison with that of the material before extrusion;
- c) said condensing step is carried out at a temperature lower than that of said hot gas;
- d) said condensing step is carried out under a stream of gas, preferably being in counter-direction to said continuous flow;
- e) at least one of said steps of heating said pellets is carried out in an atmosphere of an inert gas, preferably being nitrogen;
- f) both steps of heating said pellets are carried out in a gas atmosphere, said gas being fed from said condensing step to said crystallizing step;
- g) said used plastic material comprises a polyester material, particularly polyethylene terephthalate.

4. The process as claimed in Claim 1, further comprising the step of decontaminating the material to be reclaimed from migrated or adhering substances, said step preferably comprising sucking material off which is selected

from volatiles and fines, wherein preferably the gas of at least one of said steps of heating said pellets is separated from any solid matter and is recycled.

5. The process as claimed in Claim 1, further comprising the step of monitoring the quality of the material to be reclaimed to obtain a grading value and controlling said desired temperature of said gas or of said heat using said grading value to obtain a substantially uniform desired quality, said grading value preferably comprising the intrinsic viscosity.

6. The process as claimed in Claim 1, further comprising at least one of the following steps:

- a) cooling said pellets after said condensing step;
- b) immediately feeding said pellets from said crystallizer to said condensing step without intermediate storage;
- c) admixing pellets of fresh plastic material not previously used to said used plastic material, preferably comprising
 - the step of solid state condensing said pellets in a continuous flow after said crystallization step; and
 - the step of cooling said pellets after said condensing step;
 - said admixing step being carried out after said cooling step.

7. The process as claimed in Claim 1, wherein, after continuously extruding said plastic material, the rheological properties of the plastic melt are measured and converted to an intrinsic viscosity.

8. The process as claimed in Claim 7, wherein the conditions in the solid state condensing step are controlled according to the difference between the measured and the desired intrinsic viscosity.

9. The process as claimed in Claim 1, wherein the temperature in the solid state condensing step is controlled and the residence time is held substantially constant.

10. The process as claimed in Claim 1, wherein, during the extrusion step for continuously extruding said plastic material, a gas barrier enhancing additive is added.

11. The process as claimed in Claim 10, wherein said gas barrier enhancing additive is at least one of a scavenging type additive and a gas permeation restricting type additive.

12. The process as claimed in Claim 1, wherein the crystallization in said crystallizing step is carried out to a degree of crystallization of less than 50% and preferably less than 45%.

13. A plant for upgrading cleaned used plastic material to be reclaimed comprising

continuous extruding means for continuously extruding said plastic material;

continuously operated cutting means for cutting said plastic material as they are supplied by said extrusion means to convert them into pellets;

feeding means directly connected to said cutting means for feeding said pellets without intermediate storage; and

continuous crystallizing means for said pellets as they are fed from said cutting means, said crystallizing means including means creating a stream of hot gas to heat the pellets to crystallizing temperature, and preferably a continuous fluidized bed of predetermined characteristic of flow of said pellets, such as a plunger characteristic, said continuous fluidized bed, in particular, including first gas supply means for supplying a fluidisation gas for said pellets; and

continuous heating means postponed to said crystallization means for heating said pellets in a continuous flow for solid state condensation, said heating

means preferably comprising second gas supply means for providing a stream of gas through said continuous flow of pellets, said stream of gas being, in particular, supplied by said second gas supply means in counter-direction to said continuous flow of pellets,

the plant suitably comprising feeding means directly connecting said crystallizing means and said heating means without intermediate storage.

14. The plant as claimed in Claim 13, wherein said continuous crystallizing means comprise a continuous fluidized bed of predetermined characteristic of flow of said pellets, said continuous fluidized bed including first gas supply means for supplying a fluidisation gas for said pellets, wherein at least one of said first and second gas supply means is connected to a source of an inert gas, preferably nitrogen, said first and second gas supply means being preferably interconnected and comprising a common source of an inert gas and/or comprising recycling means for said inert gas, said recycling means comprise a duct of conduits and solids separating means in said duct of conduits.

15. Plant as claimed in Claim 13, further comprising at least one of the following characteristics:

a) cooling means arranged after said heating means to cool said pellets;

b) fresh material supply means to at least one of said continuous means, said fresh material supply means being preferably connected to supply fresh plastic material to said crystallizing means.

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